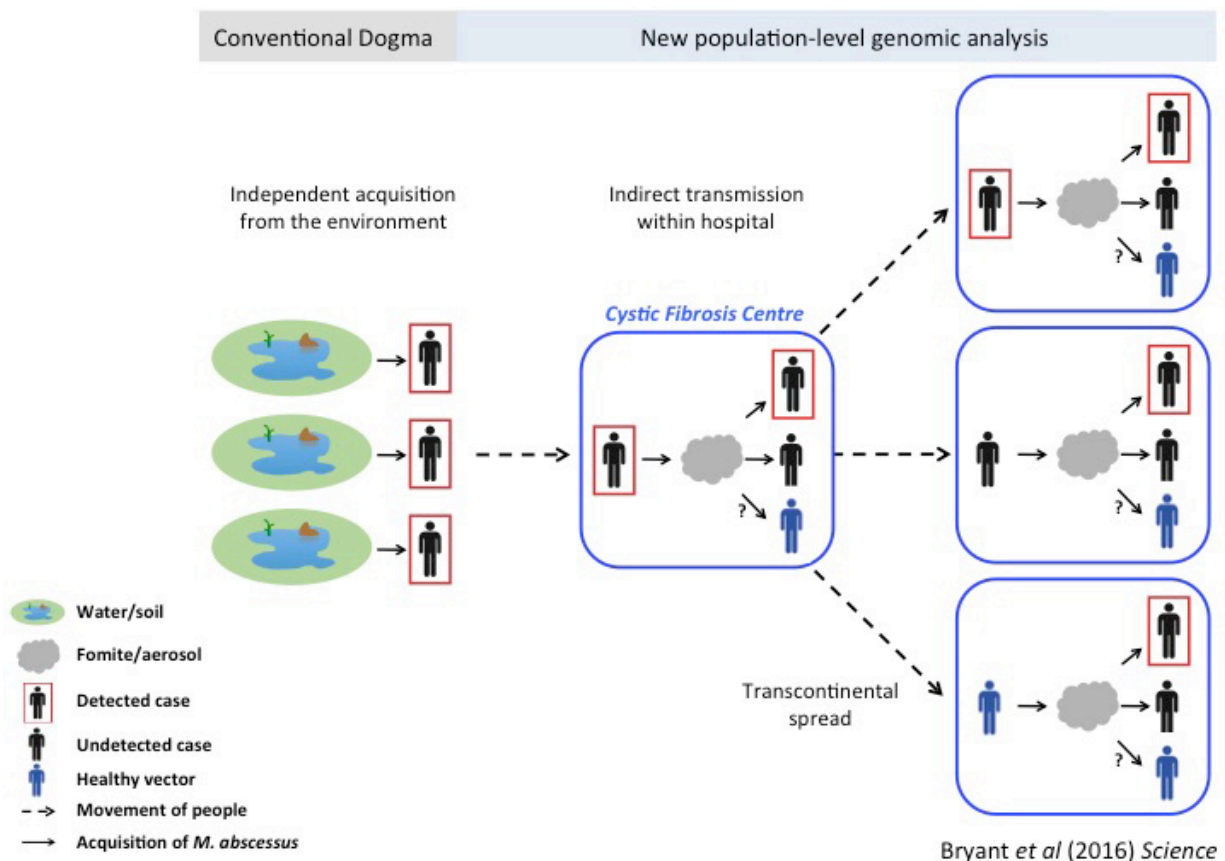


Multi-drug resistant infection spreading globally among cystic fibrosis patients

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Transmission of *Mycobacterium abscessus* in Cystic Fibrosis



Mycobacterium abscessus has recently emerged as a significant global threat to individuals with cystic fibrosis (CF) and other lung diseases. It was previously thought that patients acquired the infection from water or soil in the environment and that transmission between patients never occurred. Now, by sequencing the whole genomes of over 1,000 isolates of *M. abscessus* from individuals attending CF specialist centres in Europe, the US and Australia, researchers have

demonstrated that the majority of CF patients have acquired transmissible *M. abscessus* clones, including through airborne transmission at hospitals. Credit: Andres Floto (University of Cambridge), Josie Bryant (University of Cambridge), Julian Parkhill (WT Sanger Institute)

A multi-drug resistant infection that can cause life-threatening illness in people with cystic fibrosis (CF) and can spread from patient to patient has spread globally and is becoming increasingly virulent, according to new research published today in the journal *Science*.

The study, led by the University of Cambridge and the Wellcome Trust Sanger Institute, also suggests that conventional cleaning will not be sufficient to eliminate the pathogen, which can be transmitted through contaminated surfaces or in the air.

Mycobacterium abscessus, a species of multidrug resistant mycobacteria, has recently emerged as a significant global threat to individuals with [cystic fibrosis](#) and other lung diseases. It can cause a severe pneumonia leading to accelerated inflammatory damage to the lungs, and may prevent safe lung transplantation. It is also extremely difficult to treat - fewer than one in three cases is treated successfully.

It was previously thought that patients acquired the infection from the environment and that transmission between patients never occurred. The research team had previously studied one specialist CF centre in the UK and identified genetic and epidemiological evidence suggesting person-to-person transmission of *M. abscessus* but it was unclear whether this was a one off incident.

Now, by sequencing the whole genomes of over 1,000 isolates of mycobacteria from 517 individuals attending CF specialist centres in

Europe, the US and Australia, researchers have demonstrated that the majority of CF patients have acquired transmissible forms of *M. abscessus* that have spread globally. Further analysis suggests that the infection may be transmitted within hospitals via contaminated surfaces and through airborne transmission. This presents a potentially serious challenge to [infection control](#) practices in hospitals.

Using a combination of cell-based and mouse models, the researchers showed that the recently-evolved mycobacteria were more virulent, likely to cause more serious disease in patients.

"This mycobacterium can cause very serious infections that are extremely challenging to treat, requiring combination treatment with multiple antibiotics for 18 months or longer, " says Professor Andres Floto from the Department of Medicine, University of Cambridge, and the Cambridge Centre for Lung Infection at Papworth Hospital NHS Foundation Trust. "The bug initially seems to have entered the patient population from the environment, but we think it has recently evolved to become capable of jumping from patient to patient, getting more virulent as it does so."

Professor Julian Parkhill from the Wellcome Trust Sanger Institute at Hinxton, Cambridgeshire, adds: "Our research should provide a degree of hope: now that we know the extent of the problem and are beginning to understand how the infection spreads, we can start to respond. Our work has already helped inform infection control policies and provides the means to monitor the effectiveness of these."

The Adult Cystic Fibrosis Centre at Papworth Hospital, Cambridgeshire, has led the development and implementation of new infection control policies to reduce the risk of transmission, now adopted across the UK and elsewhere. This study has also influenced the design of a new CF unit, due to open within the New Papworth Hospital on the Cambridge

Biomedical Campus in 2018, which will incorporate a state-of-the-art air handling system.

One question that the researchers will now aim to answer is how the pathogen manages to spread globally. Their current study has shown that not only can it spread between individuals within specialist centres, but it has also been able to spread from continent to continent. The mechanism for this is unclear, but the researchers speculate that healthy individuals may be unwittingly carrying the mycobacteria between countries.

The sequencing data has also revealed potential new drug targets, and the team is now focused on working with other groups at the University of Cambridge and Colorado State University to develop these further.

Dr Janet Allen, Director of Strategic Innovation at the CF Trust, said: "This paper highlights the risks posed through transmission of multi-drug resistant organisms between people with cystic fibrosis. The team in Cambridge are a world authority in this area. This work demonstrates the global threat of this infection, the risks of cross-infection within and between CF centres, and the need for improved surveillance. This study exemplifies the enormous impact of CF Trust-funded Strategic Research Centres, which were designed to generate world-class research with the very highest impact. Without the support of the CF community, this landmark study would not have been possible."

Around one in 2,500 children in the UK is born with cystic fibrosis, a hereditary condition that causes the lungs to become clogged up with thick, sticky mucus. The condition tends to decrease life expectancy among patients.

More information: Bryant, JM et al. Emergence and spread of a human transmissible multidrug-resistant nontuberculous mycobacterium. *Science*; 11 Nov 2016 [science.sciencemag.org/cgi/doi ...](https://science.sciencemag.org/cgi/doi/10.1126/science.1257530)

[1126/science.aaf8156](https://doi.org/10.1126/science.aaf8156)

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